

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1 1. (Currently Amended) A method for designing a programmable logic
2 device~~placing circuit elements into logic blocks~~, the method comprising:
3 assigning each of a plurality of~~the~~ circuit elements to a separate abstract block,
4 wherein the circuit elements are part of a user design for a programmable integrated circuit and
5 the abstract block represents a functional attribute of its assigned circuit element;
6 ~~grouping each~~ placing a respective one or more of the abstract blocks into each of
7 a plurality of logic blocks~~a logic block~~ based at least in part on a correspondence between a
8 functional attribute of ~~the~~ a particular logic block and the functional attribute of ~~each~~ an abstract
9 block placed into that logic block, wherein a first block is placed into a first logic block;
10 removing a ~~the first one of the abstract~~ block ~~blocks~~ from the first logic block in
11 response to placement information that indicates a design goal would be improved by
12 rearranging at least a portion of the user design; and
13 placing the first abstract block into a ~~different~~ second logic block on the
14 programmable integrated circuit, wherein the functional attribute of ~~removed~~ the first abstract
15 block corresponds with a functional attribute of the ~~different~~ second logic block, thus improving
16 the design goal.

1 2. (Original) The method according to claim 1 wherein the design goal
2 includes routability and signal timing in the user design.

1 3. (Original) The method according to claim 1 wherein the circuit elements
2 include lookup tables and registers.

1 4. (Original) The method according to claim 1 wherein the circuit elements
2 include DSP blocks and RAM blocks.

1 5. (Currently Amended) The method according to claim 1 ~~further~~
2 ~~comprising: wherein placing a respective one or more of the abstract blocks into each of a~~
3 ~~plurality of logic blocks further comprises:~~
4 determining whether placing an abstract block assigned to a particular ~~each~~ circuit
5 element into ~~the~~ a specific logic block violates any of a set of design rules relating to ~~the~~ that
6 specific logic block, wherein the logic blocks are grouped into clusters; and
7 determining whether placing the abstract block ~~each of the circuit elements~~ into a
8 cluster containing that specific logic block violates any of a set of design rules relating to ~~the~~ that
9 cluster.

1 6. (Original) The method according to claim 5 wherein each of the abstract
2 blocks are grouped into a cluster based on an attraction of the abstract block to the cluster, and
3 the attraction measures a number of nets and connections of nets absorbed into the cluster if the
4 abstract block is placed inside the cluster.

1 7. (Original) The method according to claim 5 wherein each of the abstract
2 blocks are grouped into a cluster based on an attraction of the abstract block to the cluster, and
3 the attraction measures a number of timing critical connections absorbed into the cluster if the
4 abstract block is placed inside the cluster.

1 8. (Currently Amended) The method according to claim 5 ~~further~~
2 ~~comprising: wherein placing a respective one or more of the abstract blocks into each of a~~
3 ~~plurality of logic blocks further comprises:~~
4 placing ~~one of the abstract~~ block ~~blocks~~ into another logic block within the same
5 cluster if placing that abstract block into ~~the~~ that specific logic block violates any of the design
6 rules relating to ~~the~~ that specific logic block; and

7 placing ~~one of~~ the abstract block blocks into another cluster if placing that
8 abstract block into ~~the~~ that cluster violates any of the design rules relating to ~~the~~ that cluster.

1 9. (Currently Amended) The method according to claim 1 wherein the logic
2 blocks implement functions performed by two lookup tables with less than an integer k unique
3 input variables; and the method further comprises:

4 determining whether ~~grouping each of the~~ placing an abstract block blocks into
5 ~~the a~~ logic block causes ~~any of the~~ that logic block blocks to have more than k unique input
6 variables.

1 10. (Original) The method according to claim 1 wherein the placement
2 information includes floorplanning information.

1 11. (Original) The method according to claim 1 wherein the placement
2 information includes partition information.

1 12. (Previously Presented) The method according to claim 1 wherein the
2 placement information includes data obtained by a previous placement of a portion of the user
3 design on the programmable integrated circuit.

1 13. (Canceled)

1 14. (Currently Amended) A computer program product stored on a computer
2 readable medium for ~~designing placing circuit elements in a user design for~~ a programmable
3 integrated circuit ~~into logic blocks~~, the computer program product comprising:

4 computer program instructions for assigning each of a plurality of ~~the~~ circuit
5 elements to a separate abstract block, wherein the abstract block represents a functional attribute
6 of its assigned circuit element;

7 computer program instructions for ~~grouping each placing~~ a respective one or more
8 of the abstract blocks into each of a plurality of logic blocks ~~a logic block~~ based at least in part
9 on a correspondence between a functional attribute of ~~the~~ a particular logic block and the

functional attribute of ~~each~~ an abstract block placed into that logic block, wherein a first block is placed into a first logic block;

computer program instructions for determining whether placement information indicates that a design goal would be improved by moving at least one of the abstract blocks into a different logic block; and

computer program instructions for removing the ~~at least one~~ first abstract block from a first logic block and placing the ~~at least one~~ first abstract block into a second logic block in response to the determination based on the placement information, wherein the functional attribute of the removed first abstract block corresponds with a functional attribute of the ~~different~~ second logic block.

15. (Original) The computer program product as defined in claim 14 wherein the design goal includes signal timing and routability in the user design.

16. (Currently Amended) The computer program product as defined in claim 14 wherein the logic blocks are grouped into clusters of logic blocks, and the computer program instructions for ~~grouping each~~ placing a respective one or more of the abstract blocks into each of a plurality of logic blocks ~~a logic block~~ further comprises computer program instructions for grouping each of the abstract blocks into a cluster of logic blocks based on an attraction of the abstract block to the cluster.

17. (Currently Amended) The computer program product as defined in claim 16 further comprising:

computer program instructions for determining whether ~~grouping~~ placing the abstract blocks into the clusters violates any design rules of the clusters; and

computer program instructions for determining whether ~~grouping~~ placing the abstract blocks into the logic blocks violates any design rules of the logic blocks.

18. (Original) The computer program product as defined in claim 14 wherein some of the circuit elements are lookup tables, and some of the circuit elements are registers.

1 19. (Original) The computer program product as defined in claim 16 wherein
2 the attraction measures a number of nets and connections of nets absorbed into the cluster if the
3 abstract block is placed inside the cluster.

1 20. (Original) The computer program product as defined in claim 16 wherein
2 the attraction measures a number of timing critical connections absorbed into the cluster if the
3 abstract block is placed inside the cluster.

1 21. (Currently Amended) The computer program product as defined in claim
2 17 further comprising:
3 computer program instructions for placing one of the abstract blocks into another
4 logic block if placing that abstract block to the logic block violates any of the design rules
5 relating to the logic block in which that abstract block was first placed.

1 22. (Previously Presented) The computer program product as defined in claim
2 17 further comprising:
3 computer program instructions for placing one of the abstract blocks to another
4 cluster if placing that abstract block to the first cluster violates any of the design rules relating to
5 the first cluster.

1 23. (Currently Amended) The computer program product as defined in claim
2 14 further comprising:
3 computer program instructions for determining whether placing the abstract
4 blocks ~~to~~ into the logic blocks causes any of the logic blocks to have more than k unique input
5 variables,
6 wherein the logic blocks are configurable to implement functions performed by
7 two lookup tables with less than k unique input variables.

1 24. (Original) The computer program product as defined in claim 14 wherein
2 the placement information includes floorplanning information.

1 25. (Original) The computer program product as defined in claim 14 wherein
2 the placement information includes partition information.

1 26. (Original) The computer program product as defined in claim 14 wherein
2 the placement information includes data obtained by placing logic blocks that implement
3 portions of the user design on the programmable integrated circuit.

1 27. (Currently Amended) The method of claim 1, wherein the each logic
2 block includes a first functional attribute and a second functional attribute, and wherein ~~grouping~~
3 placing each of the abstract blocks into a logic block further comprises:

4 assigning a the first abstract block associated with a first circuit element to the
5 first functional attribute of the first logic block; and

6 assigning a second abstract block associated with a second circuit element to the
7 second functional attribute of the first logic block, such that the first logic block is assigned the
8 functional attributes of the first and second circuit elements.

1 28. (Previously Presented) The method of claim 27, wherein the first
2 functional attribute of the logic block includes a register and the functional attribute of the first
3 circuit element includes a register.

1 29. (Previously Presented) The method of claim 27, wherein the second
2 functional attribute of the logic block includes a look-up table circuit adapted to implement a
3 logic function and the functional attribute of the first circuit element includes a logic function
4 capable of being implemented by the look-up table circuit.

1 29. (New) The method of claim 1 wherein a second abstract block is placed
2 into the first logic block prior to removing the first abstract block.